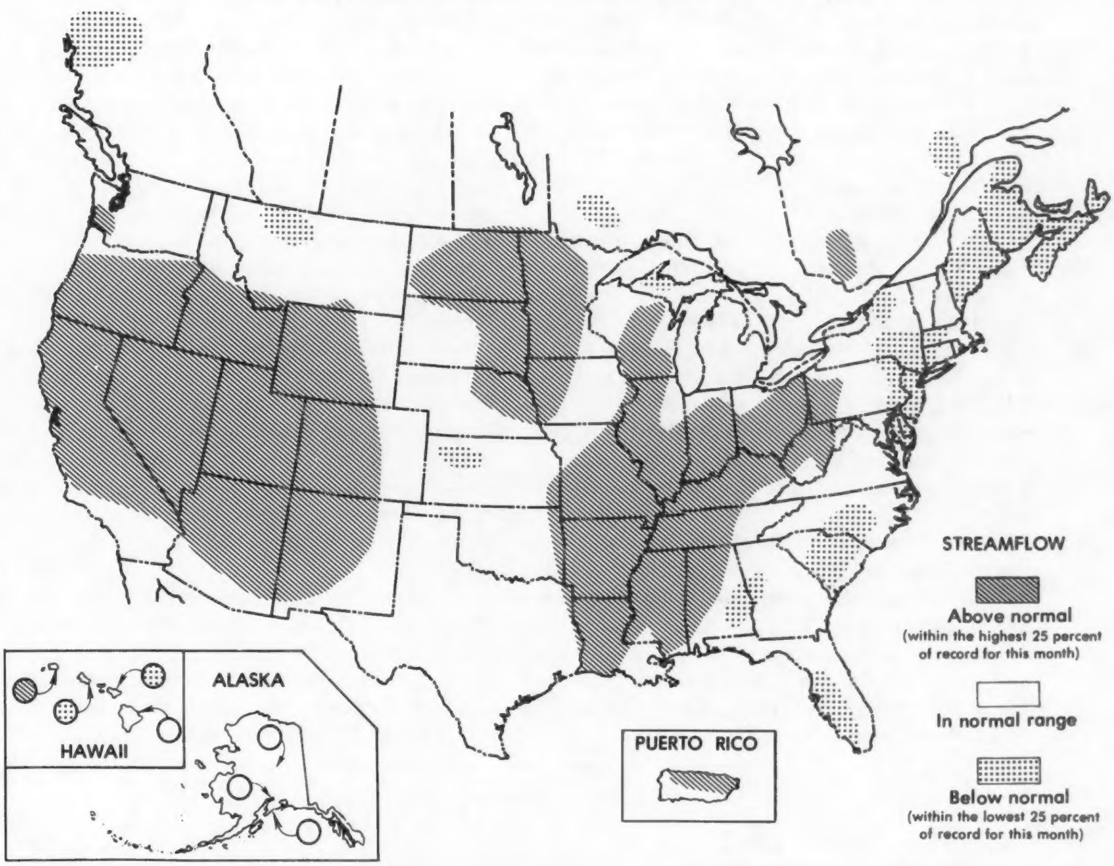
National Water Conditions

UNITED STATES
Department of the Interior
Geological Survey

CANADA
Department of the Environment
Water Resources Branch

NOVEMBER 1984

STREAMFLOW DURING NOVEMBER



Streamflow was in the normal range or above that range in most of the United States and southern Canada during November. Below-normal flows persisted in parts of Montana, Hawaii, and many States and Provinces along the East Coast. Monthly mean flows were highest of record for November in parts of Colorado, Idaho, Utah, and Wyoming, and were lowest of record for the month in parts of Florida and the Atlantic Provinces.

Contents of selected reservoirs in the Northeast generally declined during November and were below average at many locations.

STREAMFLOW CONDITIONS DURING NOVEMBER 1984

Streamflow generally increased seasonally in Alabama, Tennessee, Michigan, Nebraska, New Brunswick, most States in the Northeast and the Far West including Hawaii, and in much of the Ohio River basin. Monthly mean flows remained in the above-normal range in Mississippi and parts of adjacent States, and in most States extending from Illinois and Wisconsin to the West Coast. Monthly mean flows were highest of record for November in parts of Colorado, Idaho, Utah, and Wyoming. (See table on page 3.) For example, in southern Wyoming, the monthly mean flow of 750 cfs (cubic feet per second) at North Platte River above Seminoe Reservoir near Sinclair (drainage area, 8,134 square miles) was highest for the month in 46 years of record and marked the 7th consecutive month of flows in the above-normal range at that site. (See graph on page 3.) Mean flows at index sites on the Humboldt River at Palisades, Nevada, and on the Snake River at Weiser, Idaho, have remained in the above-normal range for 29 consecutive months and illustrate the overall wet trend in the West during the last 2 to 3 years.

By contrast, streamflows generally decreased in Alaska, Florida, Mississippi, southwestern Canada, and in the central Rockies, and were variable elsewhere in the United States and southern Canada. Monthly mean flows remained in the below-normal range in parts of Georgia and adjacent coastal States in the Southeast, New York, Maine, Connecticut, Montana, Hawaii, and much of southeastern Canada. During November, mean flows decreased into the below-normal range in parts of Kansas, Maryland, Massachusetts, Michigan, and New Jersey. Monthly and/or daily mean flows were lowest of record for November in parts of New Brunswick, Nova Scotia, Florida, and Hawaii. (See table on page 3.) For example, the monthly mean flow of 90 cfs and the daily mean flow of 55 cfs on the 20th at Peace River at Arcadia, Florida (drainage area, 1,367 square miles), were lowest for November in 53 years of record, and flow at that site remained in the below-normal range for the 3d consecutive month.

Flood stages, as designated by the National Weather Service, were exceeded on many rivers and small streams in the lower Mississippi River and Ohio River basins throughout the month as a result of runoff from heavy rains. Flooding affected mainly lowlands and agricultural lands, and ranged from minor to moderate. Monthly mean flow of the Mississippi River at Vicksburg, Mississippi, increased sharply to 229 percent of the long-term median flow and was the second highest flow for November in 56 years of record. In eastern Florida, coastal flooding with extensive beach erosion occurred during high tides on November 23. Minor to moderate flooding also occurred in parts of Oregon, Nevada, and California, according to reports by the National Weather Service.

In Utah, streamflow averaged about twice the long-term median flow at the seven index gaging stations and remained in the above-normal range, as a result of record precipitation during October and November. These above-average flows add to the potential for another record year for Great Salt Lake where the elevation on November 30, 1984, was 4,208.30 feet above sea level, 3.25 feet higher than a year ago, and only 3.3 feet lower than the all-time high elevation of record set in 1873. The maximum elevation during 1984 of 4,209.25 feet above sea level occurred July 1–3.

The combined flow of the three largest rivers in the lower 48 States—Mississippi, St. Lawrence, and Columbia rivers—was 1,101,500 cubic feet per second during November, 68 percent above the long-term average and 50 percent above last month. These three large river systems account for runoff from more than half of the conterminous United States, and provide a useful check on the status of the Nation's surface-water resources.

Contents of selected reservoirs in the Northeast generally declined during November and were below average at most locations. In Oklahoma and Texas, most reservoirs increased in contents but remained below average at several locations. Elsewhere in the Nation, reservoir contents were generally near or above average.

CONTENTS

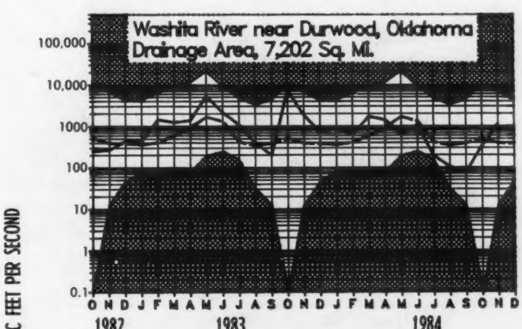
NEW EXTREMES DURING NOVEMBER 1984 AT STREAMFLOW INDEX STATIONS

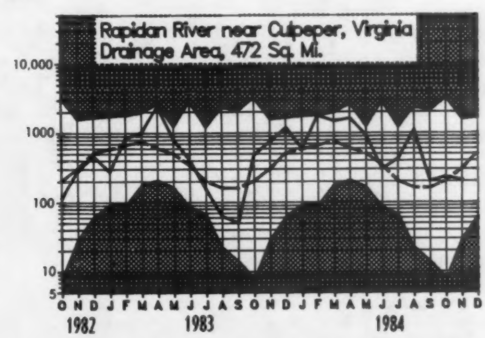
Station number	Stream and place of determination	Drainage area (square miles)	Years of record	Previous November extremes (period of record)		November 1984			
				Monthly mean in cfs (year)	Daily mean in cfs (year)	Monthly mean in cfs	Percent of median	Daily mean in cfs	Day
	LOW FLOWS								
01AQ01	Lepreau River at Lepreau, New Brunswick, Canada.	92.3	66	63.6 (1946)	5.3 (1946)	38.1	11	13.9	1
01EF001	LaHave River at West Northfield, Nova Scotia, Canada.	484	69	219 (1929)	39 (1946)	178	12	169	15
02296750	Peace River at Arcadia, Florida.	1,367	53	101 (1981)	77 (1981)	90	21	55	20
16229000	Kalihi Stream near Honolulu, Oahu, Hawaii.	2.61	70	0.46 (1953)	0.22 (1953)	1.14	23	0.16	24
16587000	Honopou Stream near Huelo, Maui, Hawaii.	0.64	73	0.25 (1962)	0.15 (1932)	0.45	11	0.12	(*)
	HIGH FLOWS								
06630000	North Platte River above Seminoe Reservoir near Sinclair, Wyoming.	8,134	45	745 (1965)	991 (1961)	750	197	879	1
06710500	Bear Creek at Morrison, Colorado.	164	76	86.7 (1923)	106 (1923)	79.3	453	115	1
07352000	Saline Bayou near Lucky, Louisiana.	154	44	713 (1957)	1,880 (1941)	264	595	2,220	29
09085000	Roaring Fork River at Glenwood Springs, Colorado.	1,451	78	852 (1929)	1,120 (1911)	943	180	...	...
09180500	Colorado River near Cisco, Utah.	24,100	73	5,702 (1983)	7,610 (1941)	6,891	191	7,520	1
13269000	Snake River at Weiser, Idaho.	69,200	74	25,370 (1983)	31,300 (1927)	26,830	178	28,600	2

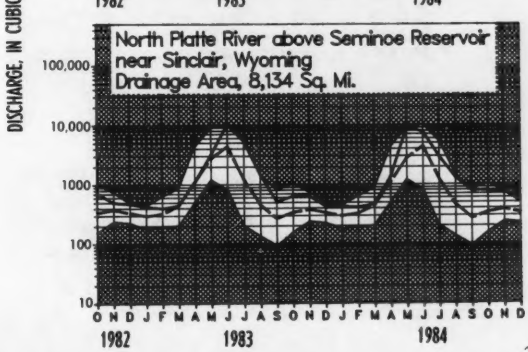
*Occurred more than once.

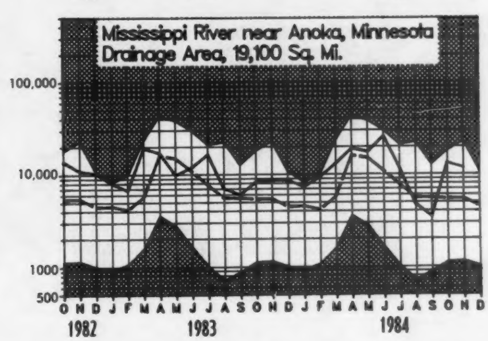
SURFACE WATER – MONTHLY MEAN DISCHARGE IN KEY STREAMS

Unshaded area indicates range between highest and lowest record for the month. Dashed line indicates median of monthly values for reference period, 1951–80. Heavy line indicates mean for current period.





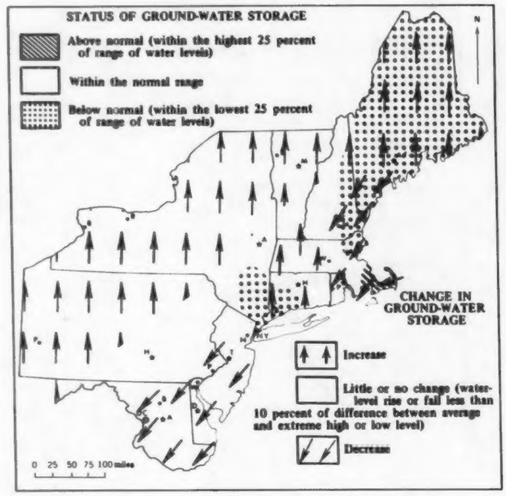




GROUND-WATER CONDITIONS DURING NOVEMBER 1984

Ground-water levels continued to decline in east-central parts of New England and in much of New Jersey, Delaware, and Maryland. (See map.) However, levels began rising in many other areas of the region, including much of Maine and New York State, central Massachusetts, and in western parts of Connecticut, Pennsylvania, and Maryland. Levels near end of November were within the normal range of levels for this time of year in most of the region. Exceptions included below-average levels in Maine, southeastern New York, and southwestern Connecticut; and above-average levels in southeastern Massachusetts.

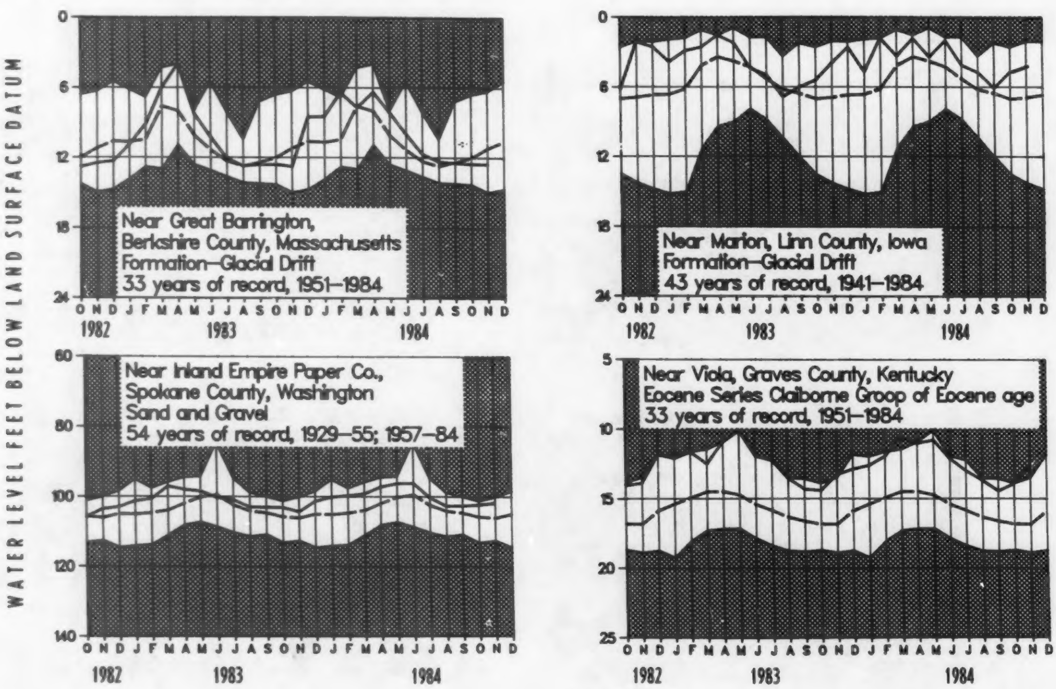
In the southeastern States, ground-water levels rose in Kentucky and Louisiana, and rose in most index wells in West Virginia, Mississippi, and Georgia. Water levels declined in North Carolina; trends were mixed in Virginia and Arkansas. Water levels were above average in Kentucky and in most of West Virginia and North Carolina. Levels were mixed with respect to average in Virginia and Louisiana, and below average in Arkansas. New high ground-water levels for November were noted in West Virginia, Kentucky, and, despite a net decline during the month, in North Carolina. In the key well in Memphis, Tennessee, the level rose less than a foot, but reached a new November low at month's end.



Map shows ground-water storage near end of November and change in ground-water storage from end of October to end of November.

MONTH-END GROUND-WATER LEVELS IN KEY WELLS

Unshaded area indicates range between highest and lowest record for the month. Dashed line indicates average of monthly levels in previous years. Heavy line indicates level for current period.



WATER LEVELS IN KEY OBSERVATION WELLS IN SOME REPRESENTATIVE AQUIFERS IN THE CONTERMINOUS UNITED STATES—NOVEMBER 1984

Aquifer and location	Water level in feet with reference to land-surface datum	Departure from average in feet	Net change in water level in feet since:		Year records began	Remarks
			Last month	Last year		
Glacial drift at Hanska, south-central Minnesota	–7.21	+1.23	+0.45	+4.43	1942	
Glacial drift at Roscommon in north-central part of Lower Peninsula, Michigan	–4.37	+0.53	+0.40	–0.47	1935	
Glacial drift at Marion, Iowa	–4.24	+2.40	+0.47	–0.30	1941	
Glacial drift at Princeton in northwestern Illinois	–9.74	+4.46	+1.02	–1.34	1943	
Petersburg Granite, southeastern Piedmont near Fall Zone, Colonial Heights, Virginia	–17.65	–1.38	–0.49	–6.10	1939	
Glacial outwash sand and gravel, Louisville, Kentucky (U.S. well no. 2)	–17.09	+8.66	+0.12	+0.62	1946	
500-foot sand aquifer near Memphis, Tennessee (U.S. well no. 2)	–103.98	–15.02	+0.22	–0.68	1941	November low.
Granite in eastern Piedmont Province, Chapel Hill, North Carolina (U.S. well no. 5)	–39.85	+3.62	–0.61	+2.57	1931	November high.
Sparta Sand in Pine Bluff industrial area, Arkansas	–227.90	–23.15	–1.80	+10.20	1958	
Eutaw Formation in the City of Montgomery, Alabama (U.S. well no. 4)	–20.8	+2.2	+0.7	–2.1	1952	
Limestone aquifer on Cockspur Island, Savannah area, Georgia (U.S. well no. 6)	–33.02	+6.42	+0.76	+0.28	1956	
Sand and gravel in Puget Trough, Tacoma, Washington	–100.88	+9.31	+0.70	+1.05	1952	
Pleistocene glacial outwash gravel, North Pole, northern Idaho (U.S. well no. 3)	–454.6	+5.8	–0.9	+1.0	1929	
Snake River Group: southwestern Snake River Plain aquifer, at Eden, Idaho	–119.9	–4.1	–0.3	+1.4	1957	
Alluvial valley fill in Flowell area, Millard County, Utah (U.S. well no. 9)	–0.20	+29.63	+1.76	+23.55	1929	
Alluvial sand and gravel, Platte River Valley, Ashland, Nebraska (U.S. well no. 6)	–4.80	+1.52	–1.40	+0.76	1935	
Alluvial valley fill in Steptoe Valley, Nevada	–8.58	+4.68	+0.28	+1.55	1950	Alltime high.
Pleistocene terrace deposits in Kansas River valley, at Lawrence, northeastern Kansas	–20.60	+0.32	+0.33	–0.90	1953	
Alluvium and Paso Robles clay, sand, and gravel, Santa Maria Valley, California	–96.97	+48.73	+1.36	+18.23	1957	Alltime high.
Valley fill, Elfrida area, Douglas, Arizona (U.S. well no. 15)	–106.8	–27.55	+0.4	+2.4	1951	
Hueco bolson, El Paso area, Texas	–262.90	–17.52	+0.30	–2.84	1965	November low.
Evangeline aquifer, Houston area, Texas	–311.53	–8.44	+3.52	–0.18	1965	

In the central and western Great Lakes States, ground-water levels rose in Wisconsin, Ohio, and Iowa, and mostly rose in Minnesota. Trends were mixed in Michigan. Water levels were above average in Iowa, and mixed with respect to average in Minnesota and Michigan. No new extremes were reached.

In the western States, ground-water levels rose in Washington, Nevada, and Arizona, and declined in North Dakota. Levels mostly rose in New Mexico and Texas, and mostly declined in Idaho. Trends were generally mixed in other western States. Water levels were above average in Washington and Nebraska, and in most of southern California and Utah. Levels were below average in Arizona, Texas, and in most of Kansas. Levels in other States were mixed with respect to average. A new November high ground-water level was recorded in the Logan observation well in Utah, despite a slight net decline during the month. New alltime high water levels were reached in the Santa Maria observation well in southern California, in 28 years of record, and in the Steptoe Valley well in Nevada, in 34 years of record. A new alltime low level occurred in the Dayton key well in New Mexico in 41 years of record. The level in the Avra Valley well in Arizona showed no net change during the month, thus equaling the new alltime low reached at the end of last month in 21 years of record.

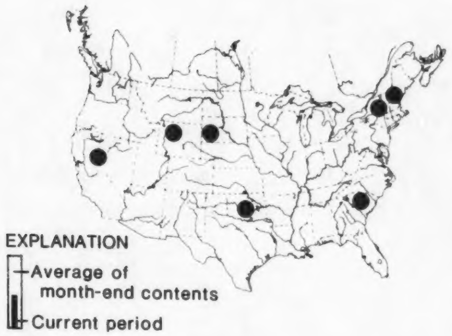
USABLE CONTENTS OF SELECTED RESERVOIRS NEAR END OF NOVEMBER 1984

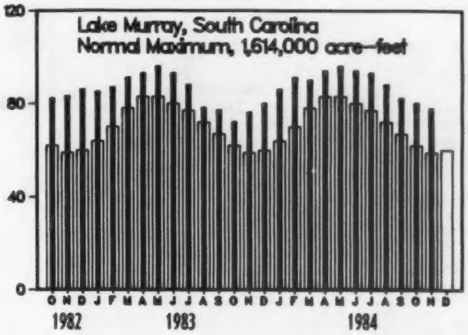
[Contents are expressed in percent of reservoir capacity. The usable storage capacity of each reservoir is shown in the column headed "Normal maximum."]

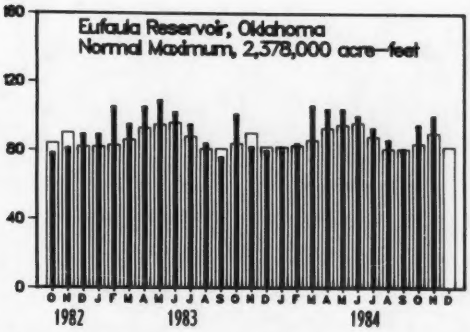
Reservoir Principal uses: F–Flood control I–Irrigation M–Municipal P–Power R–Recreation W–Industrial	Percent of normal maximum				Normal maximum (acre-feet)[a]
	End of Nov. 1984	End of Nov. 1983	Average for end of Nov.	End of Oct. 1984	
NOVA SCOTIA					
Rossignol, Mulgrave, Falls Lake, St. Margaret's Bay, Black, and Ponhook Reservoirs (P)	23	30	40	34	[b]226,300
QUEBEC					
Allard (P)	75	56	62	76	280,600
Gouin (P)	79	73	68	81	6,954,000
MAINE					
Seven reservoir systems (MP)	43	62	57	44	4,098,000
NEW HAMPSHIRE					
First Connecticut Lake (P)	62	61	74	68	76,450
Lake Francis (FPR)	61	72	78	56	99,310
Lake Winnipesaukee (PR)	53	91	59	62	165,700
VERMONT					
Harriman (P)	70	66	64	67	116,200
Somerset (P)	78	51	70	73	57,390
MASSACHUSETTS					
Cobble Mountain and Borden Brook (MP)	63	69	72	65	77,920
NEW YORK					
Great Sacandaga Lake (FPR)	48	52	56	53	786,700
Indian Lake (FMP)	64	77	60	62	103,300
New York City reservoir system (MW)	52	50	...	60	1,680,000
NEW JERSEY					
Wanaque (M)	61	76	66	72	85,100
PENNSYLVANIA					
Allegheny (FPR)	32	35	34	37	1,180,000
Pymatuning (FMR)	91	92	80	90	188,000
Raystown Lake (FR)	66	67	51	67	761,900
Lake Wallenpaupack (PR)	48	70	52	48	157,800
MARYLAND					
Baltimore municipal system (M)	93	86	83	96	261,900
NORTH CAROLINA					
Bridgewater (Lake James) (P)	91	94	77	89	288,800
Narrows (Badin Lake) (P)	86	95	92	93	128,900
High Rock Lake (P)	32	56	55	50	234,800
SOUTH CAROLINA					
Lake Murray (P)	78	76	60	80	1,614,000
Lakes Marion and Moultrie (P)	74	77	64	77	1,862,000
SOUTH CAROLINA--GEORGIA					
Clark Hill (FP)	50	57	51	58	1,730,000
GEORGIA					
Burton (PR)	82	86	58	99	104,000
Sinclair (MPR)	67	100	73	92	214,000
Lake Sidney Lanier (FMPR)	53	50	50	56	1,686,000
ALABAMA					
Lake Martin (P)	79	87	61	88	1,375,000
TENNESSEE VALLEY					
Clinch Projects: Norris and Melton Hill Lakes (FPR)	33	30	31	34	2,229,300
Douglas Lake (FPR)	20	23	18	27	1,394,000
Hiwassee Projects: Chatuge, Nottely, Hiwassee, Apalachia, Blue Ridge, Ocoee 3, and Parksville Lakes (FPR)	54	52	42	57	1,012,000
Holston Projects: South Holston, Watauga, Boone, Fort Patrick Henry, and Cherokee Lakes (FPR)	41	37	35	46	2,880,000
Little Tennessee Projects: Nantahala, Thorpe, Fontana, and Chilhowee Lakes (FPR)	42	43	41	49	1,478,000
WISCONSIN					
Chippewa and Flambeau (PR)	80	89	75	90	365,000
Wisconsin River (21 reservoirs) (PR)	78	90	66	73	399,000
MINNESOTA					
Mississippi River headwater system (FMR)	26	20	27	30	1,640,000
NORTH DAKOTA					
Lake Sakakawea (Garrison) (FIPR)	88	8[illegible]	87	89	22,700,000
SOUTH DAKOTA					
Angostura (I)	69	74	73	68	127,600
Belle Fourche (I)	53	46	40	46	185,200
Lake Francis Case (FIP)	48	52	50	62	4,834,000
Lake Oahe (FIP)	83	85	...	86	22,530,000
Lake Sharpe (FIP)	99	99	95	100	1,725,000
Lewis and Clarke Lake (FIP)	91	94	92	94	477,000
NEBRASKA					
Lake McConaughy (IP)	85	91	68	88	1,948,000
OKLAHOMA					
Eufaula (FPR)	102	82	89	95	2,378,000
Keystone (FPR)	73	85	98	62	661,000
Tenkiller Ferry (FPR)	110	88	98	103	628,200
Lake Altus (FIMR)	7	41	45	7	133,000
Lake O'The Cherokees (FPR)	92	98	82	93	1,492,000
OKLAHOMA--TEXAS					
Lake Texoma (FMPRW)	91	97	92	81	2,722,000
TEXAS					
Bridgeport (IMW)	55	77	46	52	386,400
Canyon (FMR)	81	89	76	83	385,600
International Amistad (FIMPW)	68	77	87	66	3,497,000
International Falcon (FIMPW)	33	47	78	33	2,668,000
Livingston (IMW)	101	102	84	108	1,788,000
Possum Kingdom (IMPRW)	84	82	98	72	570,200
Red Bluff (PI)	29	13	27	29	307,000
Toledo Bend (P)	88	86	80	88	4,472,000
Twin Buttes (FIM)	9	22	31	9	177,800
Lake Kemp (IMW)	70	101	86	67	268,000
Lake Meredith (FWM)	35	44	39	35	796,900
Lake Travis (FIMPRW)	58	79	78	56	1,144,000
MONTANA					
Canyon Ferry (FIMPR)	80	93	90	79	2,043,000
Fort Peck (FPR)	88	88	85	89	18,910,000
Hungry Horse (FIPR)	84	84	85	85	3,451,000
WASHINGTON					
Ross (PR)	82	86	79	88	1,052,000
Franklin D. Roosevelt Lake (IP)	94	102	100	95	5,022,000
Lake Chelan (PR)	67	73	65	76	676,100
Lake Cushman (PR)	55	68	83	61	359,500
Lake Merwin (P)	92	100	91	100	245,600
IDAHO					
Boise River (4 reservoirs) (FIP)	53	71	54	53	1,235,000
Coeur d'Alene Lake (P)	60	85	53	59	238,500
Pend Oreille Lake (FP)	34	54	50	55	1,561,000
IDAHO--WYOMING					
Upper Snake River (8 reservoirs) (MP)	69	74	56	73	4,401,000
WYOMING					
Boysen (FIP)	88	81	80	94	802,000
Buffalo Bill (IP)	79	80	71	82	421,300
Keyhole (F)	41	26	43	41	193,800
Pathfinder, Seminoe, Alcova, Kortes, Glendo, and Guernsey Reservoirs (I)	71	71	47	69	3,056,000
COLORADO					
John Martin (FIR)	63	20	12	56	364,400
Taylor Park (IR)	66	62	53	67	106,200
Colorado–Big Thompson project (I)	85	82	56	85	730,300
COLORADO RIVER STORAGE PROJECT					
Lake Powell; Flaming Gorge, Fontenelle, Navajo, and Blue Mesa Reservoirs (IFPR)	93	93	...	95	31,620,000
UTAH--IDAHO					
Bear Lake (IPR)	82	83	58	85	1,421,000
CALIFORNIA					
Folsom (FIP)	61	71	52	63	1,000,000
Hetch Hetchy (MP)	57	84	42	65	360,400
Isabella (FIR)	44	53	24	46	568,100
Pine Flat (FI)	55	75	42	51	1,001,000
Clair Engle Lake (Lewiston) (P)	79	85	70	76	2,438,000
Lake Almanor (P)	87	95	49	87	1,036,000
Lake Berryessa (FIMW)	84	92	75	83	1,600,000
Millerton Lake (FI)	34	66	41	31	503,200
Shasta Lake (FIPR)	73	79	65	72	4,377,000
CALIFORNIA--NEVADA					
Lake Tahoe (IPR)	76	95	47	74	744,600
NEVADA					
Rye Patch (I)	94	94	55	89	194,300
ARIZONA--NEVADA					
Lake Mead and Lake Mohave (FIMP)	92	94	70	92	27,970,000
ARIZONA					
San Carlos (IP)	72	100	18	71	935,100
Salt and Verde River system (IMPR)	76	80	38	76	2,019,100
NEW MEXICO					
Conchas (FIR)	61	68	79	58	330,100
Elephant Butte and Caballo (FIPR)	64	53	28	62	2,453,000

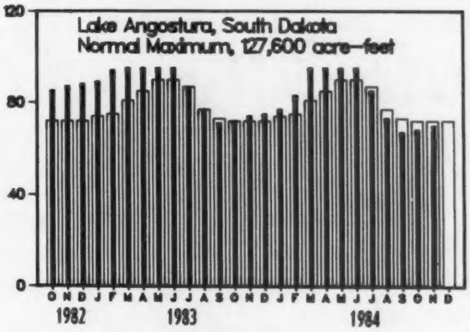
[a]1 acre-foot = 0.0436 million cubic feet = 0.326 million gallons = 0.504 cubic feet per second day.
[b]Thousands of kilowatt-hours (the potential electric power that could be generated by the volume of water in storage).

USABLE CONTENTS OF SELECTED RESERVOIRS AND RESERVOIR SYSTEMS, OCTOBER 1982 TO NOVEMBER 1984

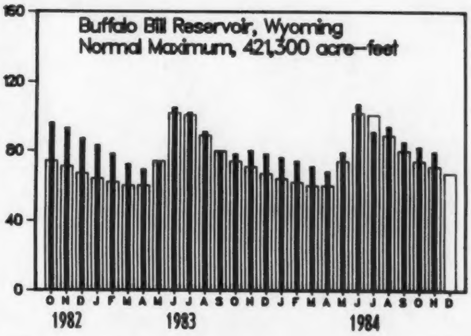


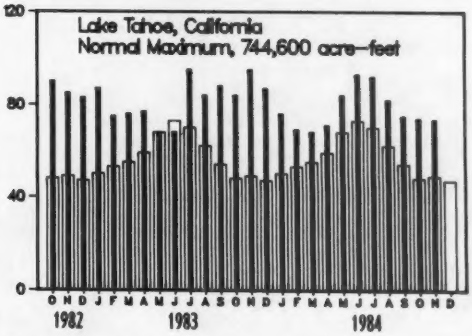


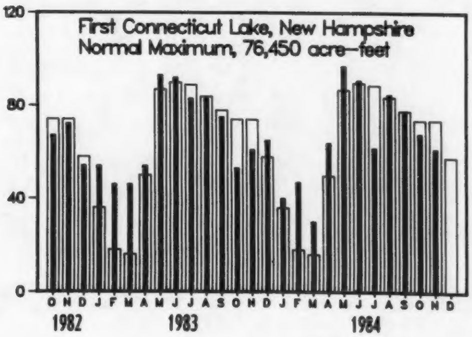


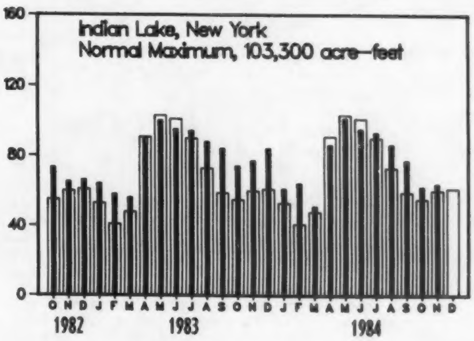


PERCENT OF NORMAL MAXIMUM









FLOW OF LARGE RIVERS DURING NOVEMBER 1984

Station number	Stream and place of determination	Drainage area (square miles)	Mean annual discharge through September 1980 (cubic feet per second)	November 1984					
				Monthly mean discharge (cubic feet per second)	Percent of median monthly discharge, 1951–80	Change in discharge from previous month (percent)	Discharge near end of month		
							Cubic feet per second	Million gallons per day	Date
01014000	St. John River below Fish River at Fort Kent, Maine	5,690	9,647	5,623	79	+103	4,150	2,682	30
01318500	Hudson River at Hadley, N.Y	1,664	2,909	1,490	62	+27	1,200	780	30
01357500	Mohawk River at Cohoes, N.Y	3,456	5,734	2,900	61	+101	2,700	1,750	30
01463500	Delaware River at Trenton, N.J	6,780	11,750	3,549	36	–3	4,040	2,611	30
01570500	Susquehanna River at Harrisburg, Pa	24,100	34,530	12,420	50	+104	52,200	33,740	30
01646500	Potomac River near Washington, D.C.	11,560	[1]11,490	5,550	125	+50	39,500	25,530	30
02105500	Cape Fear River at William O. Huske Lock near Tarheel, N.C	4,810	5,005	1,358	70	+1	1,443	933	30
02131000	Pee Dee River at Peedee, S.C	8,830	9,851	3,716	82	+6	4,245	2,743	28
02226000	Altamaha River at Doctortown, Ga	13,600	13,880	4,213	84	+32	4,240	2,740	28
02320500	Suwannee River at Branford, Fla	7,880	6,987	3,840	115	–14	3,680	2,378	30
02358000	Apalachicola River at Chattahoochee, Fla	17,200	22,570	11,200	100	0	13,300	8,600	30
02467000	Tombigbee River at Demopolis lock and dam near Coatopa, Ala	15,400	23,300	11,500	182	+22	52,000	33,600	30
02489500	Pearl River near Bogalusa, La	6,630	9,768	7,562	295	–26	12,900	8,340	30
03049500	Allegheny River at Natrona, Pa	11,410	[1]19,480	32,820	240	+174	23,500	15,190	25
03085000	Monongahela River at Braddock, Pa.	7,337	[1]12,510	13,360	173	+186	9,000	5,800	25
03193000	Kanawha River at Kanawha Falls, W. Va	8,367	12,590	9,741	123	+113	6,400	4,140	26
03234500	Scioto River at Higby, Ohio	5,131	4,547	3,219	198	+346	3,030	1,958	30
03294500	Ohio River at Louisville, Ky[2]	91,170	116,000	110,000	176	+209	87,750	56,714	25
03377500	Wabash River at Mount Carmel, Ill	28,635	27,220	24,000	217	+192	36,700	23,720	29
03469000	French Broad River below Douglas Dam, Tenn	4,543	6,798	2,875	61	+38	.....	.....	...
04084500	Fox River at Rapide Croche Dam, near Wrightstown, Wis[2]	6,150	4,163	4,772	136	+10	4,348	2,810	25
04264331	St. Lawrence River at Cornwall, Ontario–near Massena, N.Y[3]	299,000	242,700	264,800	107	–2	265,000	171,300	30
02NG001	St. Maurice River at Grand Mere, Quebec	16,300	25,150	14,200	78	+100	17,300	11,180	30
05082500	Red River of the North at Grand Forks, N. Dak	30,100	2,551	2,060	163	–8	1,140	737	30
05133500	Rainy River at Manitou Rapids, Minn.	19,400	12,830	7,700	79	+4	8,310	5,370	26
05330000	Minnesota River near Jordan, Minn.	16,200	3,402	6,217	692	+70	4,500	2,910	30
05331000	Mississippi River at St. Paul, Minn	36,800	[1]10,610	20,130	321	+19	14,600	9,440	21
05365500	Chippewa River at Chippewa Falls, Wis	5,600	5,100	4,399	114	–12	330	213	29
05407000	Wisconsin River at Muscoda, Wis	10,300	8,617	15,011	229	+35	11,670	7,542	30
05446500	Rock River near Joslin, Ill	9,551	5,873	10,000	264	+72	7,300	4,720	30
05474500	Mississippi River at Keokuk, Iowa	119,000	62,620	100,200	218	+54	63,800	41,240	30
06214500	Yellowstone River at Billings, Mont	11,796	7,038	4,114	106	–7	3,540	2,287	28
06934500	Missouri River at Hermann, Mo	524,200	79,490	112,600	206	+44	102,000	65,900	27
07289000	Mississippi River at Vicksburg, Miss[4]	1,140,500	576,600	732,970	229	+96	762,000	492,500	26
07331000	Washita River near Dickson, Okla.	7,202	1,368	1,144	293	+239	1,160	749	23
08276500	Rio Grande below Taos Junction Bridge, near Taos, N. Mex	9,730	725	670	160	+82	470	303	30
09315000	Green River at Green River, Utah.	40,600	6,298	6,315	228	–7	5,250	3,393	30
11425500	Sacramento River at Verona, Calif	21,257	18,820	22,780	175	+111	34,300	22,170	29
13269000	Snake River at Weiser, Idaho	69,200	18,050	26,830	178	+11	27,640	17,860	29
13317000	Salmon River at White Bird, Idaho	13,550	11,250	6,080	118	–4	5,350	3,457	29
13342500	Clearwater River at Spalding, Idaho	9,570	15,480	5,943	117	+36	12,350	7,982	29
14105700	Columbia River at The Dalles, Oreg[5]	237,000	193,100	103,700	119	+16	141,900	91,710	27
14191000	Willamette River at Salem, Oreg.	7,280	23,510	59,300	222	+500	56,100	36,260	27
15515500	Tanana River at Nenana, Alaska.	25,600	23,460	11,570	139	–36	10,000	6,500	30
08MF005	Fraser River at Hope, British Columbia	83,800	96,290	48,730	83	–47	45,900	29,670	30

[1] Adjusted.
[2] Records furnished by Corps of Engineers.
[3] Records furnished by Buffalo District, Corps of Engineers, through International St. Lawrence River Board of Control. Discharges shown are considered to be the same as discharge at Ogdensburg, N.Y. when adjusted for storage in Lake St. Lawrence.
[4] Records of daily discharge computed jointly by Corps of Engineers and Geological Survey.
[5] Discharge determined from information furnished by Bureau of Reclamation, Corps of Engineers, and Geological Survey.

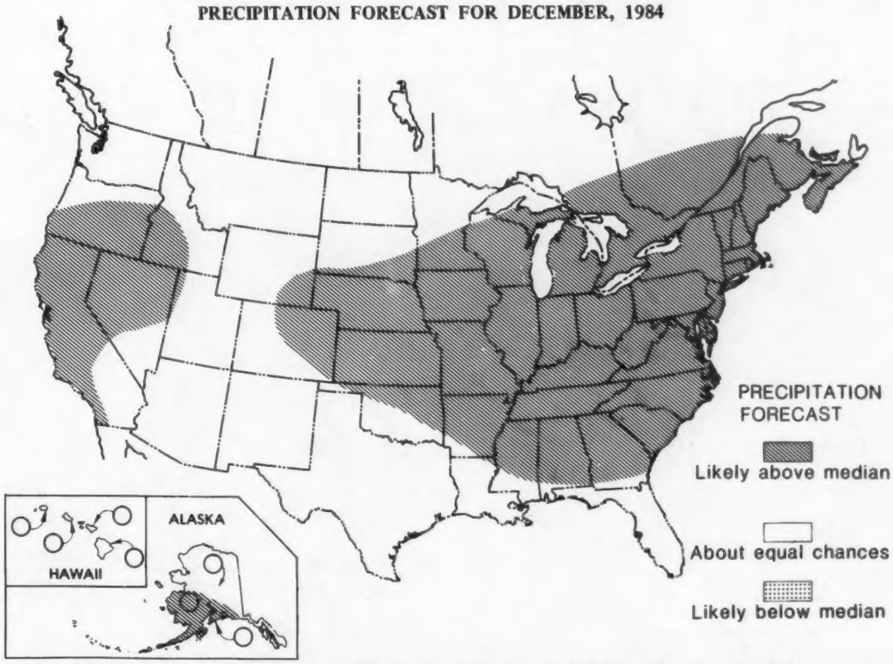
Provisional data; subject to revision

DISSOLVED SOLIDS AND WATER TEMPERATURES, NOVEMBER 1984, AT DOWNSTREAM SITES ON SIX LARGE RIVERS

Station number	Station name	November data of following calendar years	Stream discharge during month: Mean (cfs)	Dissolved-solids concentration[a]: Minimum (mg/L)	Dissolved-solids concentration[a]: Maximum (mg/L)	Dissolved-solids discharge[a]: Mean (tons per day)	Dissolved-solids discharge[a]: Minimum (tons per day)	Dissolved-solids discharge[a]: Maximum (tons per day)	Water temperature[b]: Mean, in °C	Water temperature[b]: Minimum, in °C	Water temperature[b]: Maximum, in °C
01463500	Delaware River at	1984	3,550	119	129	1,190	995	1,490	9.0	4.5	17.0
	Trenton, N.J.	1944–83	9,960	55	151	....	469	12,300	...	2.0	19.0
	(Morrisville, Pa.)	(Extreme yr)		(1955)	(1964)		(1963)	(1972)			
			[c]9,825								
04264331	St. Lawrence River at	1984	265,000	165	168	119,000	117,000	122,000	10.0	7.0	13.5
	Cornwall, Ontario, near	1975–83	281,200	162	169	126,000	106,000	137,000	8.5	4.5	12.0
	Massena, N.Y.	(Extreme yr)		(1980)	(1977)		(1978)	(1977)			
	(median streamflow at		[c]248,300								
	Ogdensburg, N.Y.)										
07289000	Mississippi River at	1984	733,000	181	219	399,000	322,000	463,000	12.5	9.0	17.0
	Vicksburg, Miss.	1975–83	395,100	188	305	261,000	123,000	451,000	13.5	8.0	20.0
		(Extreme yr)		(1977)	(1983)		(1976)	(1983)			
			[c]320,600								
03612500	Ohio River at lock and dam	1984	281,000	167	239	....	106,000	263,000	...	10.0	19.0
	53, near Grand Chain, Ill.	1954–83	168,900	129	425	....	27,200	406,000	...	1.0	19.5
	(streamflow station at	(Extreme yr)		(1957)	(1968)		(1954)	(1957)			
	Metropolis, Ill.)		[c]147,600								
06934500	Missouri River at Hermann,	1984	112,600	262	474	118,000	98,000	185,000	9.0	6.0	14.0
	Mo. (60 miles west of St.	1975–83	77,670	225	506	80,900	43,600	156,000	9.5	3.5	15.0
	Louis, Mo.)	(Extreme yr)		(1977)	(1980)		(1976)	(1977)			
			[c]54,680								
14128910	Columbia River at	1984	135,000	98	123	40,500	26,800	54,800	10.0	9.5	10.5
	Warrendale, Oreg.	1975–83	131,100	38	128	36,000	10,800	66,400	11.5	6.0	14.5
	(streamflow station	(Extreme yr)		(1980)	(1978)		(1980)	(1978)			
	at The Dalles, Oreg.)		[c]87,960								

[a]Dissolved-solids concentrations, when not analyzed directly, are calculated on basis of measurements of specific conductance.
[b]To convert °C to °F: [(1.8 X °C) + 32] = °F.
[c]Median of monthly values for 30-year reference period, water years 1951–80, for comparison with data for current month.

PRECIPITATION FORECAST FOR DECEMBER, 1984



(From Monthly and Seasonal Weather Outlook Published by National Weather Service)

LAND SUBSIDENCE IN THE SAN JOAQUIN VALLEY, CALIFORNIA, AS OF 1980

The abstract and illustration below are from the report, *Land subsidence in the San Joaquin Valley, California, as of 1980*, by R. L. Ireland, J. F. Poland, and F. S. Riley: U.S. Geological Survey Professional Paper 437-I, 93 pages, 1984. This report may be purchased for $8.00 from Eastern Distribution Branch, Text Products Section, U.S. Geological Survey, 604 South Pickett St., Alexandria, VA 22304 (check or money order payable to U.S. Geological Survey); or from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402 (payable to Superintendent of Documents).

ABSTRACT

Land subsidence due to ground-water overdraft in the San Joaquin Valley began in the mid-1920's and continued at increasing rates until surface water was imported through major canals and aqueducts in the 1950's and late 1960's. In areas where surface water replaced withdrawal of ground water, water levels in the confined system rose sharply and subsidence slowed or essentially eased.

The three major subsiding areas in the San Joaquin Valley in this report are the Los Banos-Kettleman City area, largely in western Fresno County; the Tulare-Wasco area, mostly in Tulare County; and the Arvin-Maricopa area, in Kern County.

The latest areawide leveling was in 1972 in the Los Banos-Kettleman City area and in 1969–70 in the Tulare-Wasco and Arvin-Maricopa areas. The 1972 leveling in the Los Banos-Kettleman City area showed that subsidence rates had decreased sharply with the importation of surface water through the California Aqueduct in the late 1960's and early 1970's. The California Aqueduct leveling showed a continued decrease in the rate of subsidence along the aqueduct through 1975, followed by increased subsidence during the drought years of 1976–77.

Leveling by the Los Angeles Department of Water and Power in the Tulare-Wasco area showed that east and west of Delano, subsidence continued into 1974. (See figure 1.) In the late 1960's and early 1970's, water levels in wells recovered to levels of the 1940's and 1950's throughout most of the western and southern parts of the valley, in response to decreased ground-water withdrawals because of the importation of surface water through the California Aqueduct. Concurrently, the borehole extensometers recorded decreasing compaction rates. By the mid-1970's, compaction had diminished to near zero at some sites.

Data collected at water-level and extensometer sites during the 1976–77 drought showed the effect of the heavy demand on the ground-water reservoir. With the water of compaction gone, artesian head declined 10 to 20 times as fast as during the first cycle of long-term drawdown that ended in the late 1960's. Extensometers measured compaction ranging from 0.1 to 0.5 foot in 1977. In 1978–79 water levels recovered to or above the 1976 predrought levels. Extensometer response ranged from compaction of a few hundredths of a foot to expansion of nearly 0.20 foot.

The report suggests continued monitoring of land subsidence in the San Joaquin Valley, utilizing extensometers, water-level recorders or measurements, and periodic releveling.

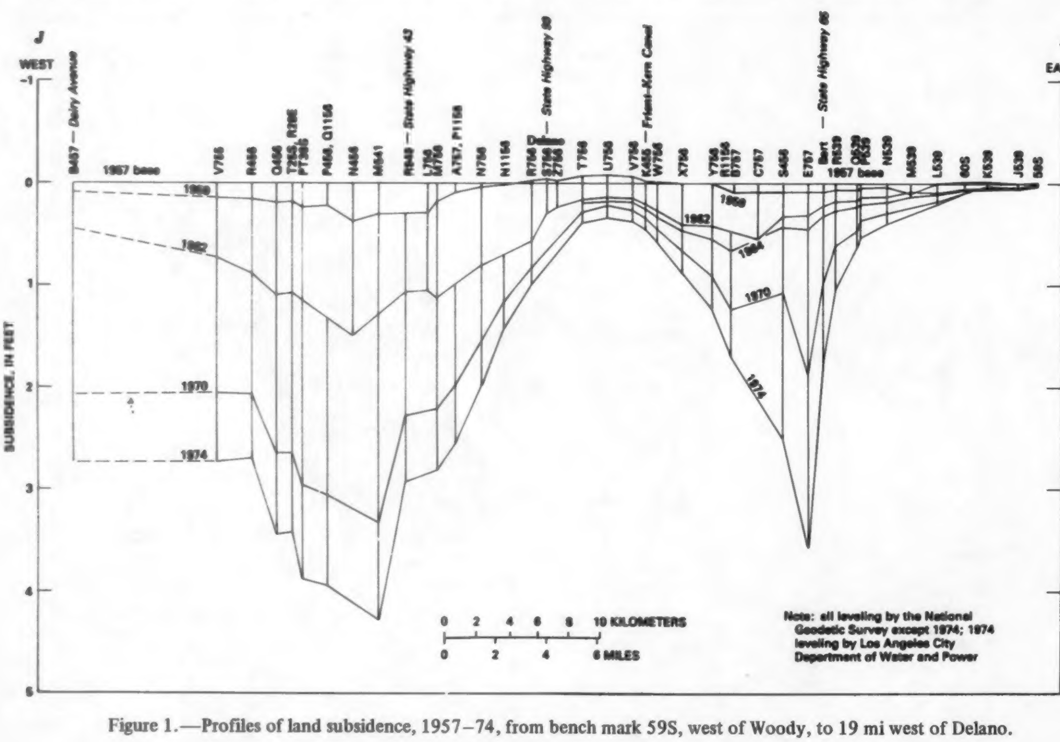
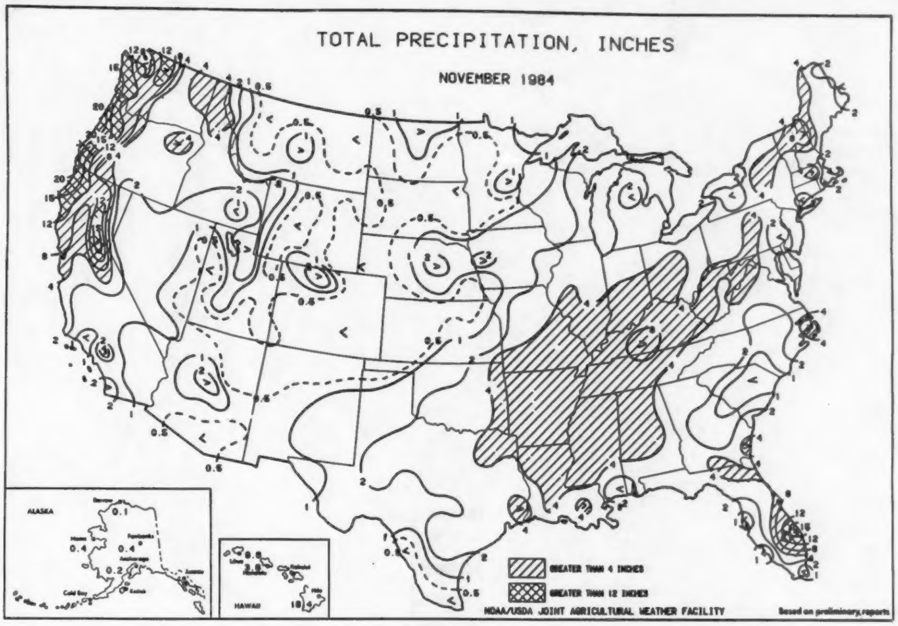


Figure 1.—Profiles of land subsidence, 1957–74, from bench mark 59S, west of Woody, to 19 mi west of Delano.



(From Weekly Weather and Crop Bulletin published by National Weather Service and Department of Agriculture.)

NATIONAL WATER CONDITIONS
November 1984

Based on reports from the Canadian and U.S. Field offices; completed December 11, 1984

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EXPLANATION OF DATA

Cover map shows generalized pattern of streamflow for the month based on 18 index stream-gaging stations in Canada and 164 index stations in the United States. Alaska and Hawaii inset maps show streamflow only at the index gaging stations that are located near the points shown by the arrows.

Streamflow for the current month is compared with flow for the same month in the 30-year reference period, 1951–80. Streamflow is considered to be *below the normal range* if it is within the range of the low flows that have occurred 25 percent of the time (below the lower quartile) during the reference period. Flow is considered to be *above the normal range* if it is within the range of the high flows that have occurred 25 percent of the time (above the upper quartile). Shorter reference periods are used for the Puerto Rico index stations because of the limited records available.

Flow higher than the lower quartile but lower than the upper quartile is described as being *within the normal range*. In the National Water Conditions, the median is obtained by ranking the 30 flows for each month of the reference period in their order of magnitude; the highest flow is number 1, the lowest flow is number 30, and the average of the 15th and 16th highest flows is the median. One-half of the time you would expect the flows for the month to be below the median and one-half of the time to be above the median.

Flood frequency analyses define the relation of flood peak magnitude to probability of occurrence or recurrence interval. Probability of occurrence is the chance that a given flood magnitude will be exceeded in any one year. Recurrence interval is the reciprocal of probability of occurrence and is the *average* number of years between occurrences. For example, a flood having a probability of occurrence of 0.01 (1 percent) has a recurrence interval of 100 years. Recurrence intervals imply no regularity of occurrence; a 100-year flood might be exceeded in consecutive years or it might not be exceeded in a 100-year period.

Statements about *ground-water levels* refer to conditions near the end of the month. The water level in each key observation well is compared with average level for the end of the month determined from the entire past record for that well or from a 30-year reference period, 1951–80. *Changes in ground-water levels*, unless described otherwise, are from the end of the previous month to the end of the current month.

Dissolved solids and temperature data for November are given for six stream-sampling sites that are part of the National Stream Quality Accounting Network (NASQAN). Dissolved solids are minerals dissolved in water and usually consist predominantly of silica and ions of calcium, magnesium, sodium, potassium, carbonate, bicarbonate, sulfate, chloride, and nitrate. Dissolved-solids discharge represents the total daily amount of dissolved minerals carried by the stream. Dissolved-solids *concentrations* are generally higher during periods of low streamflow, but the highest dissolved-solids *discharges* occur during periods of high streamflow because the total quantities of water, and therefore total load of dissolved minerals, are so much greater than at time of low flow.

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